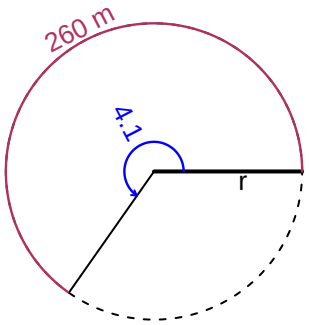
Name: Date:

Trig Final (Solution v0)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 260 meters. The angle measure is 4.1 radians. How long is the radius in meters?

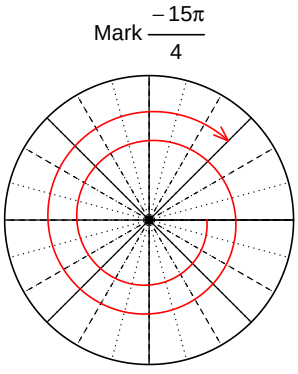


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

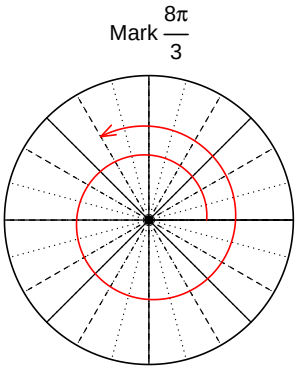
$r = 63.41$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-15\pi}{4}\right)$ and $\cos\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-15\pi/4)$



Find $\cos(8\pi/3)$

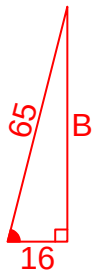
$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(8\pi/3) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-16}{65}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

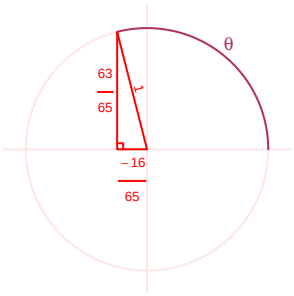
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 16^2}$$
$$B = 63$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{63}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.5 meters, a midline at $y = -5.79$ meters, and a frequency of 3.66 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.5\cos(2\pi 3.66t) - 5.79$$

or

$$y = -2.5\cos(7.32\pi t) - 5.79$$

or

$$y = -2.5\cos(23t) - 5.79$$